

Digestion, Absorption, and Transport



Chapter 3

FON 241; Digestion: L. Zienkewicz

Digestion: The process by which food is broken down into absorbable nutrients

Absorption: The passage of nutrients from the GI tract into either the blood or the lymph

Anatomy of the gastrointestinal (GI) tract:

Start at the beginning...

The mouth- Teeth crush your food; saliva blends with the food.

Pharynx- Tube shared by the digestive and respiratory systems.

Epiglottis- Cartilage that prevents food from entering the lungs during swallowing.

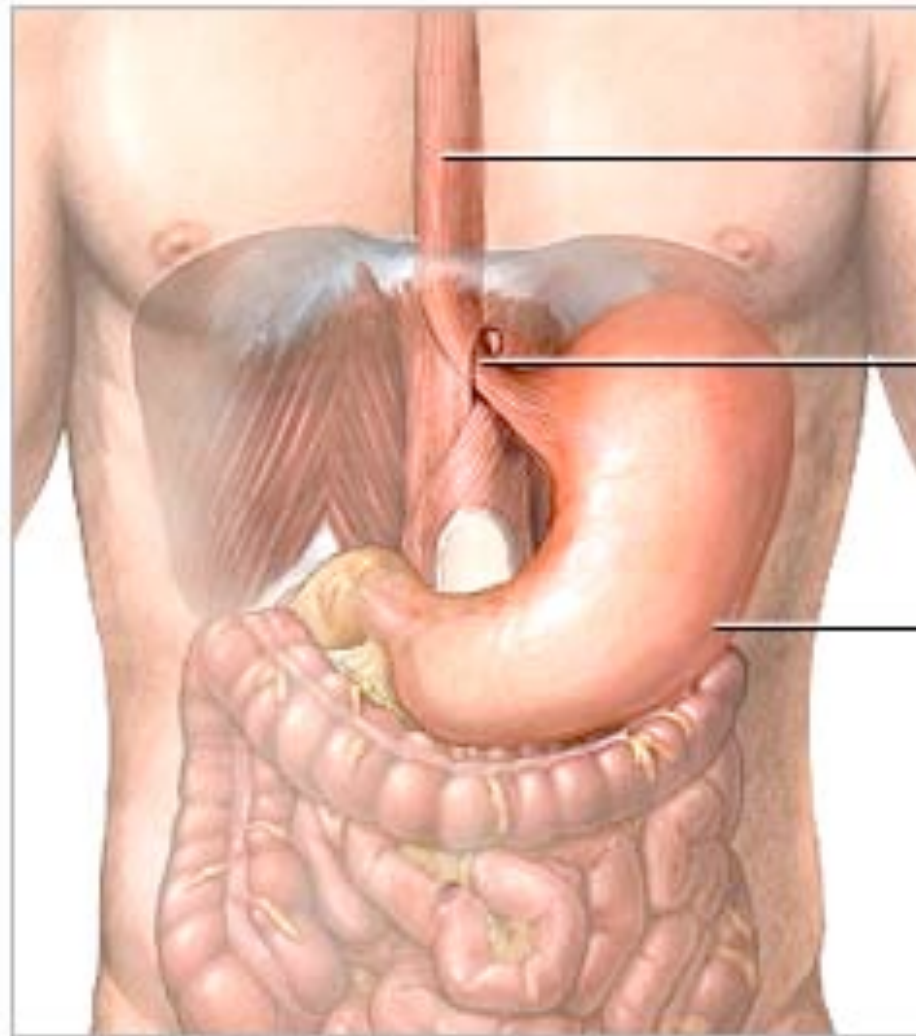
Next...

Esophagus- **the food pipe**; a long tube that carries a food bolus from the pharynx to the stomach.

Preventive measures: Esophageal sphincters
two sphincters on each end of the esophagus.

They function to:

1. **Upper ES**- allow food **into the esophagus**
2. **Lower ES**- allow food **into the stomach**
and prevents backflow of stomach contents.



Esophagus

Lower
esophageal
sphincter

Stomach

 ADAM.

What happens in the stomach?

- A **bolus** enters the stomach via the lower esophageal sphincter.
- The stomach gradually **transfers the bolus from the upper portion to the lower portion** of the stomach.
- Stomach **acids are added** and the food is ground by muscular forces
- The bolus is now called **chyme**.
- The stomach slowly releases chyme through the **pyloric sphincter** into the small intestine.

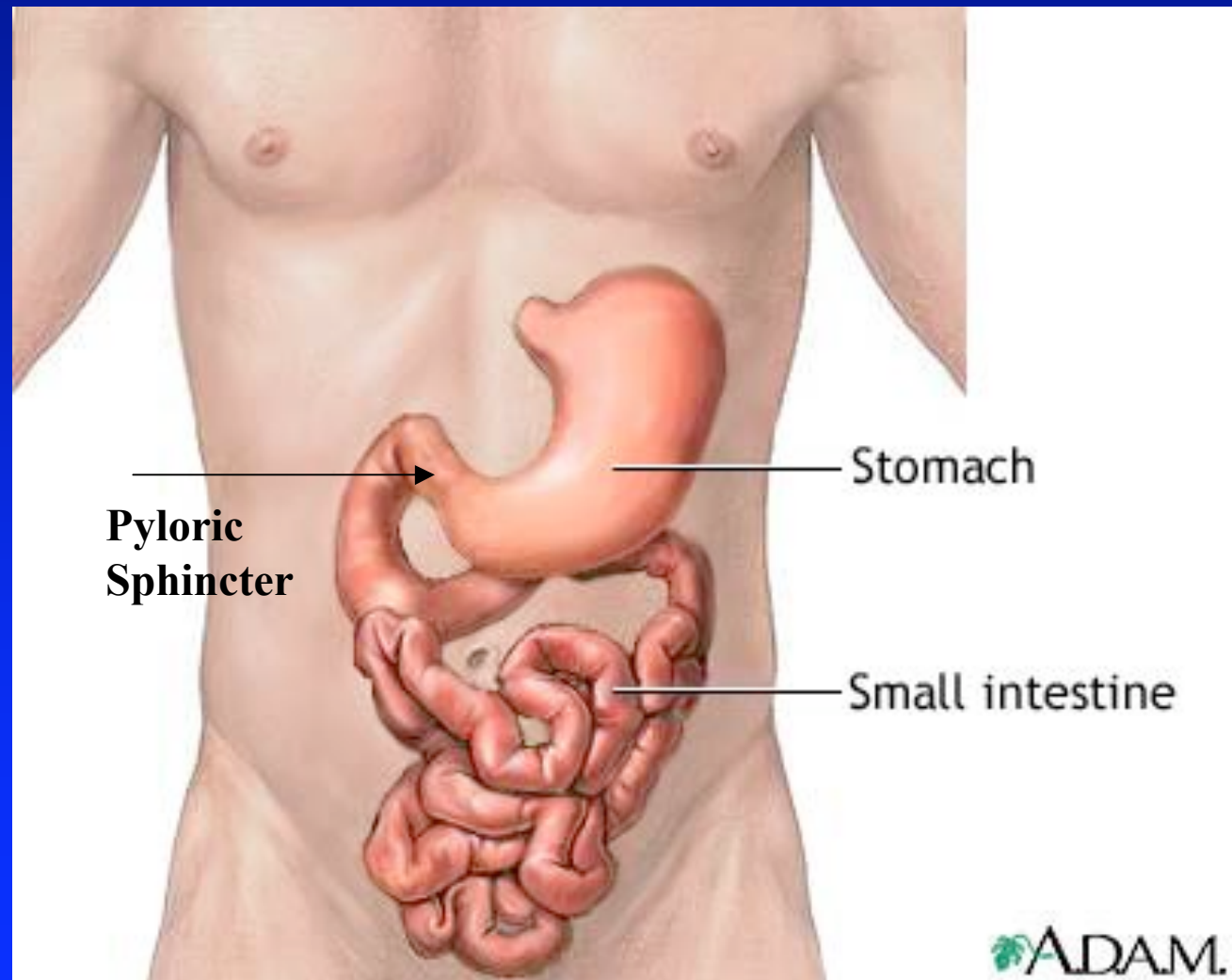
Still going...

- **Small intestine**: Made of three parts-

1. The duodenum
2. The jejunum
3. The ileum

In beginning of the small intestine, **fluids from the gallbladder and pancreas**, flow through the **common bile duct** and interact with the chyme. The chyme then moves through the 3 parts of the small intestine.

The Small Intestine



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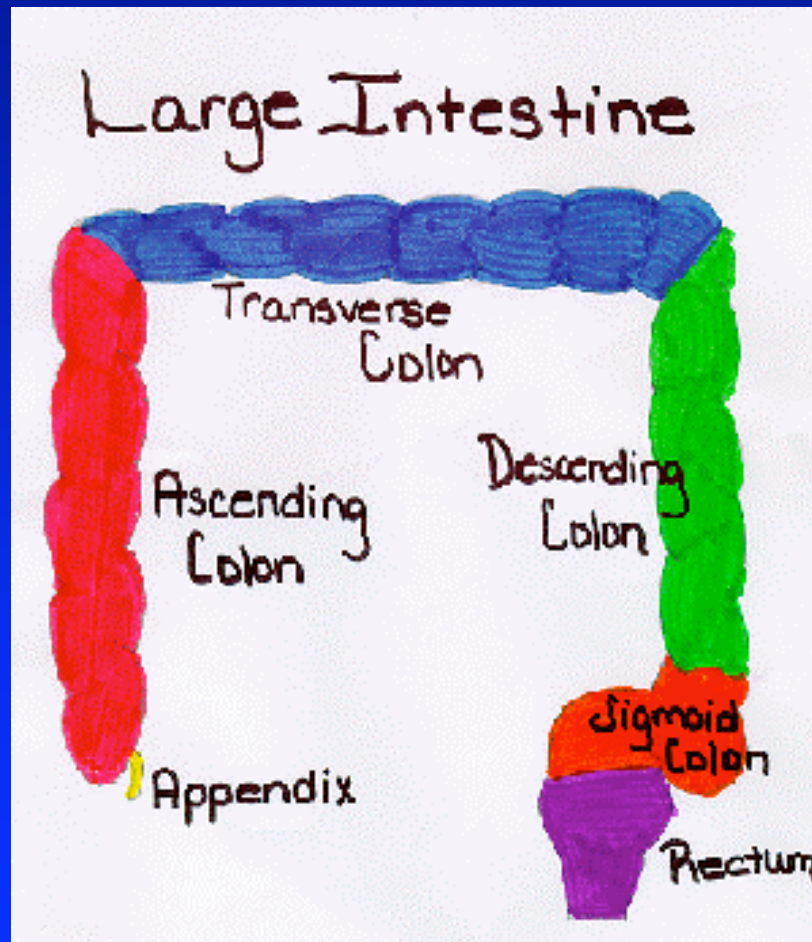
The surface area of the small intestine is roughly the size of a tennis court.



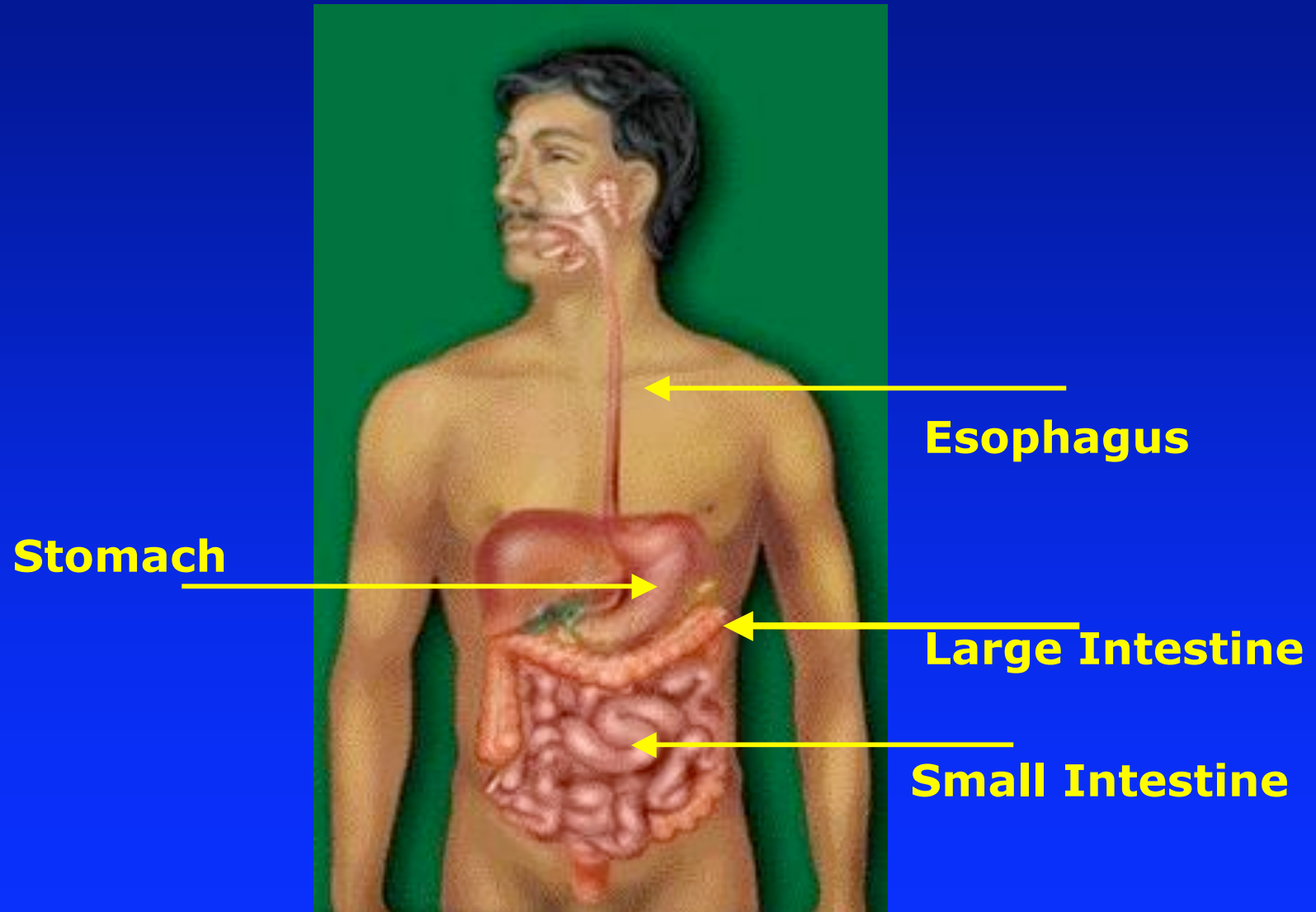
And going... through the large intestine

- Chyme passes through the Ileocecal valve, the entrance to the large intestine.
- Chyme **bypasses the appendix**.
- Chyme travels through the large intestine; water is withdrawn and a semi-solid mass forms.
- The mass moves to the rectum; rectal muscles relax.
- 2 sphincters of the anus relax, thus passing the mass through the anus.

The Large Intestine:



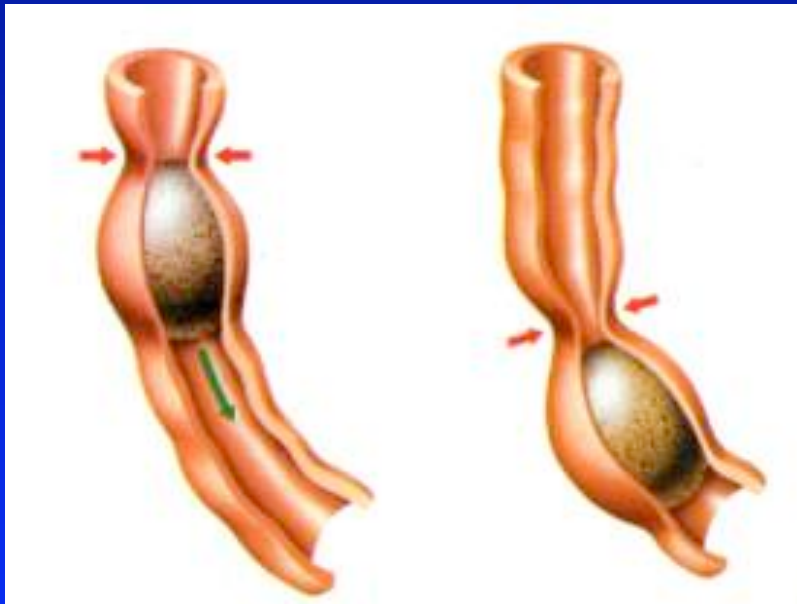
The whole picture:



How does food move through?

- Peristalsis- wavelike muscular contractions that push contents along.
- Segmentation- the circular muscles of the small intestine rhythmically squeeze and contract the contents; chyme is mixed with digestive juices, etc.
- Sphincter contractions- opening and closing of a sphincter to allow contents to enter or exit.

Peristalsis and Segmentation



Digestive Secretions:

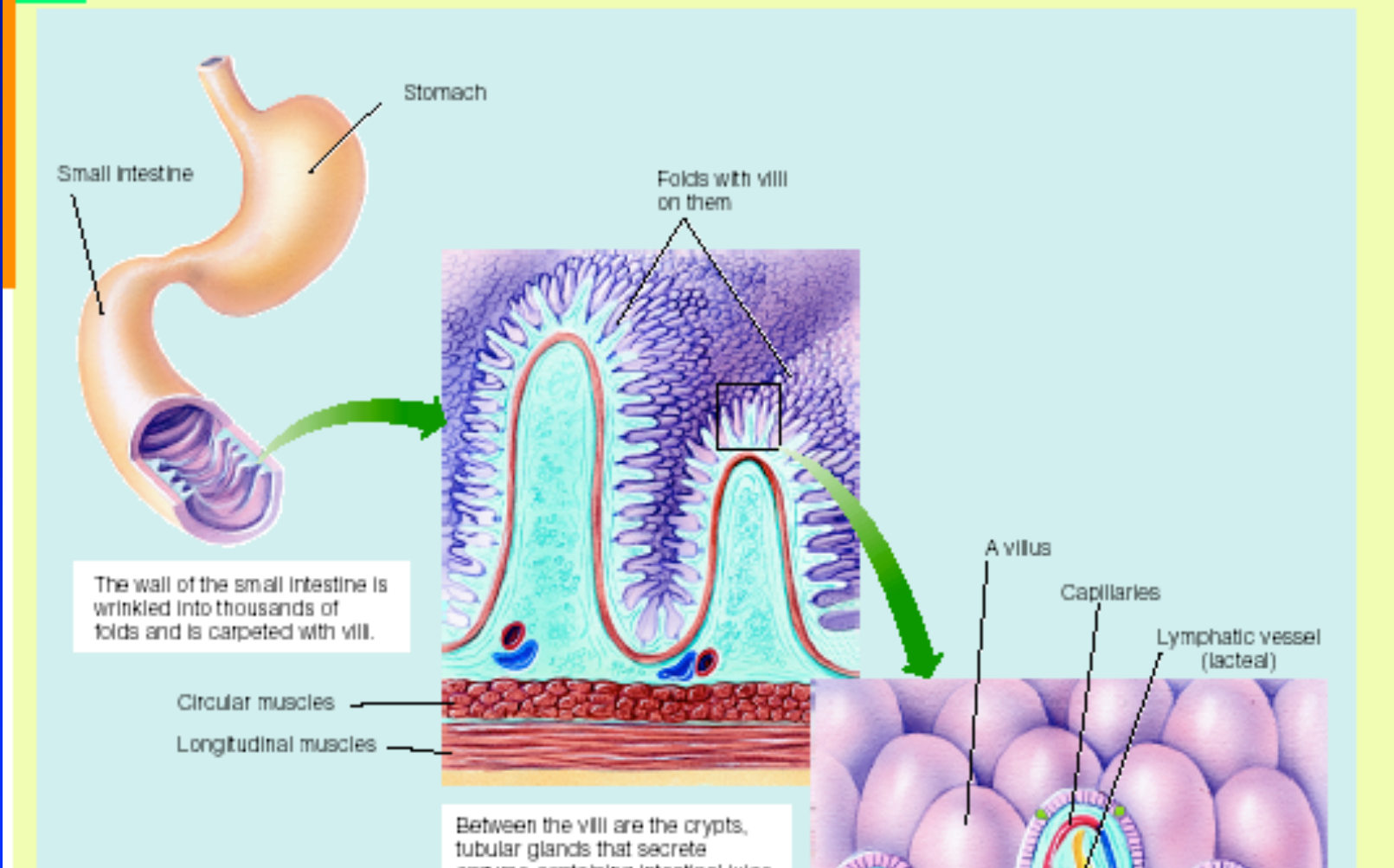
Source	Secretion
Salivary Glands	Saliva
Stomach	Gastric juice
Pancreas	Pancreatic juice
Liver (via gallbladder)	Bile
Small intestine	Intestinal Flora

Absorption

- **The small intestine:**
 - **Villi**- Small intestinal projections
 - **Microvilli**- Microscopic hairs on the villi
 - **Crypts**- crevices between the villi

All of these components make up the massive absorptive area of the intestine.

FIGURE 3-9 The Small Intestinal Villi



Nutrient Transport

- The nutrient crosses the cell and can...
 - 1. Enter the blood stream (watersoluble)
or
 - 2. Enter the lymphatic system
- Water soluble nutrients and smaller fat products are released into the **bloodstream**.
- Larger fats, fat-soluble vitamins and turned into chylomicrons and released into the **lymphatic system**

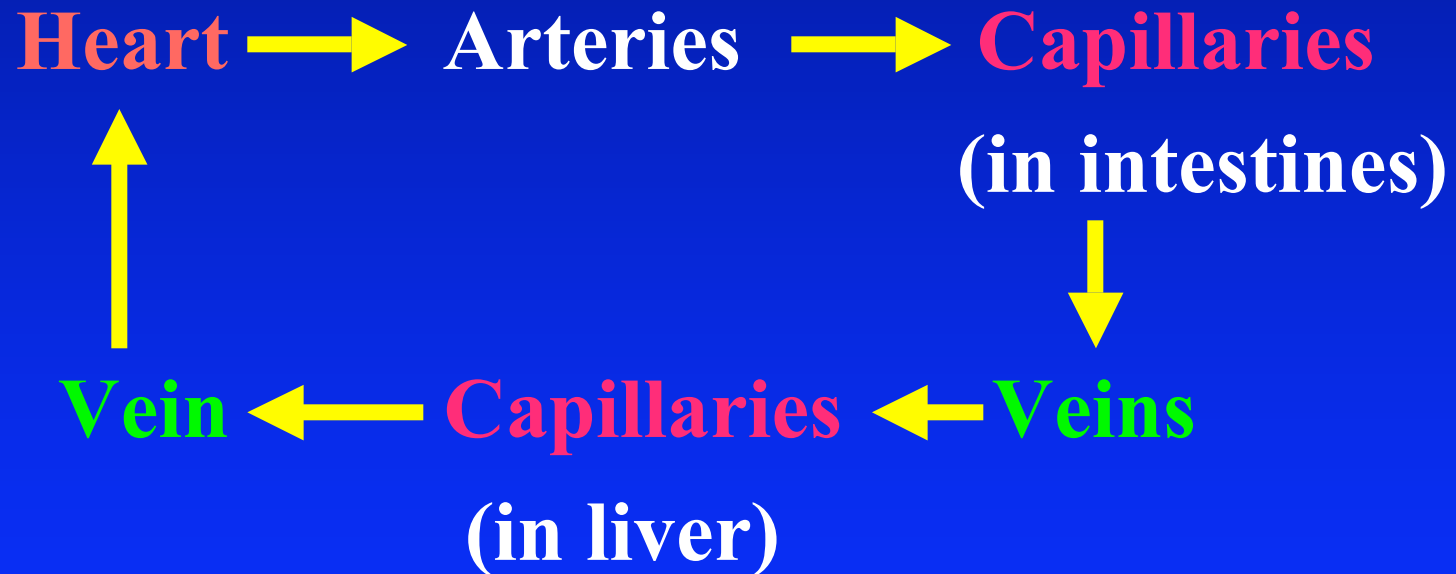
The Vascular System

- Blood delivers Oxygen and Nutrients to organs and tissues; CO₂ and waste products are carried away by the blood.
- The digestive system supplies nutrients to the blood.
- Heart → Arteries → Capillaries
← Veins ←

The Vascular System (cont.)

- Blood leaving the digestive system is **taken to the liver** via a vein.
- The liver is the body's major metabolic organ.
- It receives nutrients and other products from the digestive system; a **gatekeeper**.

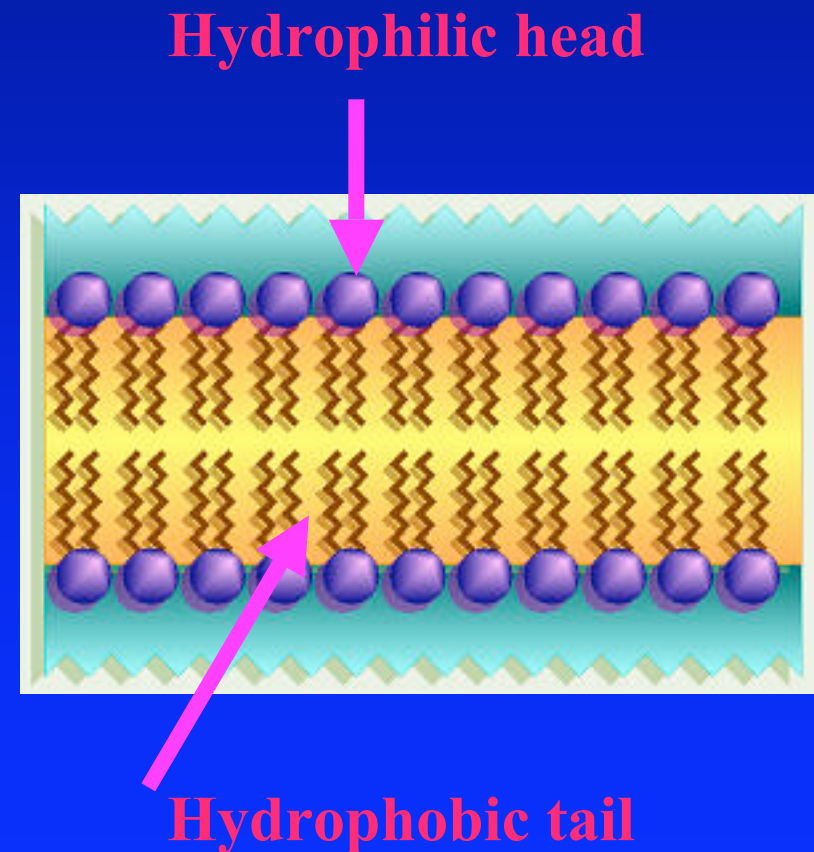
Route of blood from intestines to heart.



The Lymphatic System:

- A route for fluid from tissue to enter the blood.
- Large fats and fat-soluble vitamins use the lymph system
- Ultimately end up in the heart
- Once in the blood stream, the nutrients can be delivered to cells, organs, etc.

Chylomicron: travels via the Lymphatic System



Common GI Problems...

- Choking- improper closing of the epiglottis, food lodged in the pharynx, etc.
- Vomiting- stomach contents expelled; sometimes the contents of the duodenum are expelled.
- Diarrhea- frequent loose stools, lack of absorption and increased water in the intestine; fast motility
- Constipation- inability to defecate

Common GI Problems (cont.)...

- Gas- excessive gas in the GI tract
- Belching-excessive gas in the stomach
- Reflux- relaxation of the lower esophageal sphincter, causing stomach acid to touch the lining of the esophagus
- Ulcers- erosion of the lining of the GI tract
- Diseases of the GI tract.....